

HEALTHY COASTAL ECOSYSTEMS FOCUS TEAM

MONITORING IMPACTS

OCTOBER 2009

1109 ALASKA: Alaska Sea Grant improved marine mammal research through killer whale tracking

Activity Summary: Researchers in this project (RR/06-10) used acoustics to continuously monitor killer whale visitation and feeding behavior at a predation hot spot in the Bering Sea—the northern fur seal rookeries at the Pribilof Island of St. Paul. Impact Statement: Program Level Impact: Alaska Sea Grant places a high priority on developing cost-effective and innovative techniques to discover knowledge that can benefit marine resource management. This project proved the use of passive acoustic recording as a management tool to monitor killer whale activity near fur seal rookeries. Project Level Impact: This was the first comprehensive acoustic assessment of killer whale predation and visitation patterns near rookeries. The study demonstrated that passive acoustics are an effective technique that offers several advantages over traditional boat-based approaches to studying these elusive predators; mainly that observations are made continuously day and night and in inclement weather that would otherwise preclude killer whale detection through visual observation alone. This project spurred the North Pacific Universities Marine Mammal Research Consortium and the Alaska SeaLife Center to provide \$124,000 to expand acoustic studies of killer whales at the Pribilofs during 2008. Finally, in combination with the UAF International Polar Year Office, this study has become a project that engages the help of community members to monitor their environment for killer whales. *[M/180-01 (mon end)]*

1114 ALASKA: Alaska Sea Grant monitored the spread of invasive species

Activity: (Freitag) The Alaska Sea Grant Marine Advisory Program participated in monitoring programs for invasive species sponsored by the Alaska Department of Fish and Game, the Smithsonian Environmental Research Center, and the NOAA Office of Protected Resources. MAP currently monitors for European green crab and invasive tunicates and bryozoans. The 2008 monitoring did not document the presence of European green crabs in Southeast Alaska. It did, however, document the spread of Botrylloides (of Japan origin), a type of invasive, encrusting tunicate that can be a serious threat to shellfish. One colony was recovered on oysters at a shellfish farm at Metlakatla. This knowledge will be important for the emerging Alaska shellfish industry and will help in developing procedures to reduce the risk to cultured species. Impact Statement: Alaska Sea Grant documentation of the spread of invasive tunicates in Southeast Alaska, and extension of information and identification techniques to local shellfish farmers, has enabled growers to more closely and accurately monitor their shellfish products for signs of the species. *[A/152-20 (inv mon edu)]*

1132 CALIFORNIA: California Beach Health

This project has already had important impacts for habitat monitoring on sandy beaches and for the involvement of a variety of stakeholders in management practices. The California Grunion is now considered a Species of Special Concern and the sandy beach is considered Essential Fish Habitat according to the Magnusen-Stevens Act, as interpreted by the National Marine Fisheries Service and the California Department of Fish and Game. Citizen scientists from coastal California have been trained and have provided extensive data for an understudied species, and their commitment has extended beyond this one species to a sense of stewardship for the coastal habitat. The National Marine Fisheries Service- Southwest Region, Habitat Conservation Division has funded Grunion Greeter monitoring efforts in 2008 and plans to continue the work in future years. New management practices are in place throughout the habitat range of the grunion as a result of this work. The PI has

evaluated habitat concerns for numerous agencies including California Coastal Commission, National Marine Fisheries Service, California Department of Fish and Game, Los Angeles Beaches and Harbors, California State Parks, the Goleta Beach restoration for the County of Santa Barbara, and ocean outlets in the County of Orange. The data were used in the assessment of the effects of the Cosco Busan fuel spill in San Francisco Bay. Numerous environmental organizations including Surfrider Foundation, Heal The Bay – Santa Monica, Santa Barbara Channel Keepers, and the Audubon Society are involved in grunion studies. Aquariums including Cabrillo Marine Aquarium, Birch Aquarium at Scripps Institution of Oceanography, the Roundhouse Aquarium in Manhattan Beach, the Aquarium of the Pacific in Long Beach, and the Ty Warner Sea Center of the Santa Barbara Museum of Natural History have grunion displays and programs as part of their mission. Several State Parks have initiated new public programs for grunion runs at their sites, including San Elijo State Beach, Bolsa Chica State Beach, Doheny State Beach, and Crystal Cove State Beach. Based on the efforts of the Working Group for beach managers and field operators, we are initiating the formation of a nonprofit organization. The focus will be to develop and disseminate best practices for beach management to balance wildlife conservation and recreation. *[R/CZ-195 (mon end train)]*

1184 CALIFORNIA: New Surf-Zone Model Predicts Waves and Currents

R/CZ-188 and R/CZ-196, Feddersen, CASG scientists have created a model that estimates surf-zone waves and currents that will use real-time data collected by the Southern California Coastal Ocean Observing System (SCCOOS) to generate site-specific forecasts. This will help managers predict how long beaches must be closed to public use following contamination events. Coastal managers will begin using the model mentioned above that will predict the fate of nearshore contaminants to estimate the length of beach closures due to contamination. *[R/CZ-196 (mon mod wq)]*

395 CONNECTICUT: Sea Grant Contributes to Socioeconomic Assessment and Monitoring Guidelines for Coastal Management in the Pacific

Connecticut Sea Grant contributed to the development of Pacific regional guidelines for conducting socioeconomic assessments (SEM-Pasifika), in collaboration with the Pacific Socioeconomic Monitoring Steering Committee (including Community Conservation Network, Coral Reef Initiatives for the Pacific, Foundation of the Peoples of the South Pacific International, Global Coral Reef Monitoring Network, Locally Marine Managed Areas Network, U.S. National Oceanic and Atmospheric Administration, Secretariat of the Pacific Community, South Pacific Regional Environment Programme, University of the South Pacific, U.S. All Islands Coral Reef Committee, and WorldFish Center). The guidelines are being used by government coastal area managers, fisheries managers and non-governmental organizations to improve site management of the coastal and marine areas throughout the Pacific region. The socioeconomic information collected has improved management, monitoring, policy making, development and research. *[A/E-1 (ebm mon)]*

589 CONNECTICUT: Connecticut Sea Grant Develops a set of Socioeconomic Assessment and Monitoring Guidelines for Coastal Management in the Pacific

A socioeconomic assessment is a way to learn about the social, cultural, economic and political conditions of individuals, households, groups, communities and organizations. Socioeconomic information can be used by coastal managers for a number of purposes such as identifying threats, problems, solutions and opportunities; determining the importance, value and cultural significance of resources and their uses; assessing positive and negative impacts of management measures; assessing management effectiveness; building stakeholder participation and appropriate education and awareness programs; and verifying and documenting assumptions of socioeconomic conditions in the area, community dynamics and stakeholder perceptions. While a socioeconomic assessment is a study to collect data at one time, a socioeconomic monitoring is continuous studies to collect data over time, usually at set intervals. Socioeconomic assessments conducted at the start of a project will help understand the site and establish baseline information. Monitoring that follows the initial assessment will measure changes and help identify whether the objectives are being met. Impact: • Pacific regional guidelines SEM-Pasifika were developed in collaboration with the Pacific Socioeconomic Monitoring Steering Committee. The Committee was formed with representatives from the following organizations: * Community Conservation Network * Coral Reef Initiatives for the Pacific (CRISP) * Foundation of the Peoples of the South Pacific International (FSPI) * GCRMN (Global Coral Reef Monitoring Network) * Locally Marine Managed Areas Network (LMMA) * U.S. National Oceanic and Atmospheric Administration (NOAA) * Secretariat of the Pacific Community (SPC) * South Pacific Regional Environment Programme (SPREP) * University of the South Pacific (USP) * U.S. All Islands Coral Reef Committee * WorldFish Center • The guidelines are being used by government coastal area managers, fisheries managers and non-governmental organizations to improve site management of the coastal and marine areas throughout the Pacific region. The socioeconomic information collected has improved management, monitoring, policy making, development and research. • The guidelines have assisted interested communities in the region (including communities who have used existing methods and new communities without experiences in socio-economic assessment), management and project staff, researchers, and other practitioners, to understand important steps involved in a socioeconomic assessment and to be able to conduct the monitoring. [*ebm mon*]

105 DELAWARE: DESG Scientists Test Integrated Coastal Observing System

This Sea Grant project provided funds toward the monitoring of currents in the vicinity of the Delaware Bay mouth as part of an effort to discern vertical and lateral variability in bay-mouth flow. This information is crucial to the understanding of the coupling and exchange between Delaware Bay and the adjacent continental shelf. This project was conducted in support of two ongoing research initiatives within the University of Delaware College of Earth, Ocean, and Environment. First is the establishment and maintenance of an integrated ocean observing system at the Delaware Bay mouth. This system and related data collection were proposed by Wong, Badiy, and Trembanis in the this Delaware Sea Grant proposal: Monitoring variability in tidal and wind-driven transport in Delaware Bay with an integrated coastal observing system. Second, this project helped support an investigation by the Skarke and Trembanis of the relationship between bedform geometry and hydrodynamic forcing on Hen and Chickens Shoal. [*R.ETE-10 (mon mon)*]

106 DELAWARE: Surface currents around the US coast

Surface currents around the US coast are now routinely archived on a national HF radar data archive server. These near real-time measurements have already been integrated into the US Coast Guard search and rescue planning effort. This Sea Grant project provided funds toward the establishment, testing, and initial operation of the three HF radars monitoring currents in the vicinity of the Delaware Bay mouth as part of this national effort. *[R/ETE-8 (mon mon)]*

116 DELAWARE: DESG Study Deploys New Micro-Electrode for Use in Long-Term Observing Systems

Researchers have developed new types of microelectrodes for biogeochemical measurements made at coastal observing systems. Data from the new electrodes can be transmitted from a mooring in Delaware Bay to a shore-based laboratory via radio telecommunication. Results from the mooring showed that dissolved oxygen concentrations in lower Delaware Bay are above saturation throughout the year. Impact: Suitability of the new electrodes fixed moorings has been clearly demonstrated. The Delaware Bay Observing System has been enhanced. *[R/ECO-4 (mon)]*

1258 FLORIDA: Rapid water quality test

The quantitative test developed for the rapid detection of Enterococci bacteria in water samples can be used as a warning system to aid resource managers. *[R/C-E-52 (wq mon)]*

24 HAWAII: Sea Grant supports a volunteer coral reef monitoring program

In its ninth year of existence, the ReefWatcher monitoring program established by Hawaii Sea Grant trains volunteers to count fish and invertebrates in selected reef locations around the island of Hawaii. The goal of this program is to collect baseline data from selected monitoring sites continuously over the years. Impact: Since 2006, over 185 citizens have participated in ReefWatcher training. Data from this volunteer corp has been gathered for 16 sites, some for as long as seven years or more. Six years of ReefWatcher data has been converted from Microsoft Excel to Access database format by Hawaii Sea Grant to compliment the data management format used by the State Division of Aquatic Resources (DAR). Data collected by ReefWatcher volunteers over time has reflected trends similar to those documented by DAR scientists and, in addition, provide new data from nearshore areas not normally surveyed by the state, including intertidal and snorkel depth areas. *[(mon prot train)]*

1319 MAINE: Marine invasive species program yields statewide data and a new seasonal monitoring initiative.

In 2006, Maine Sea Grant received a regional Sea Grant National Strategic Investment grant to develop and pilot a survey protocol for science divers to monitor nearshore marine waters for aquatic nuisance species. Last year, Maine Department of Marine Resources (DMR) divers involved in the pilot used the new protocol to monitor for invasive tunicates during their annual urchin survey, which covers the entire Maine coast. DMR will continue to collect these data during future urchin surveys, and DMR

divers are now planning to work with Maine Sea Grant and members of the Maine Marine Invasive Species Working Group to conduct additional surveys that will assess seasonal changes in Maine's invasive tunicate populations. *[A/(inv mon)]*

1322 MAINE: Scientific survey protocol for monitoring marine invasive species is implemented by the Maine Department of Marine Resources

In the fall of 2006, divers from the Maine Department of Marine Resources (DMR) participated in Maine Sea Grant's effort to develop a scientific survey protocol for monitoring marine invasive species in nearshore waters of the Gulf of Maine. This effort was successful and, in May of 2007, the DMR incorporated the protocol metric for a high priority species of invasive colonial tunicate (*Didemnum* sp.) into their annual sea urchin surveys. The urchin surveys include over 7500 data points from transects conducted along the entire coast of Maine. The DMR intends to continue collecting this data in 2008, and Maine Sea Grant is currently working with the Maine Marine Invasive Species Working Group to arrange for volunteer divers to conduct comparative transects at the same locations during the fall, when populations of invasive tunicates are typically highest. *[A/EXT-03-02 (inv mon train)]*

1373 MINNESOTA: Sea Grant Research Aids Lake Superior Beach Monitoring Program

Sea Grant scientists have found that the potentially harmful bacteria species *Escherichia coli* (*E. coli*) that is used by beach monitoring programs to justify beach closures doesn't always come from harmful sources. They found the *E. coli* can be carried by benthic fish and can live as natural residents in the beach environment – in the sand, sediment, soils, and algae. Often, it's assumed that *E. coli* found during beach monitoring is washed into the water from the land or comes from sewage overflows. University of Minnesota researchers have shown that's not always the case. Their results are being used by the Lake Superior Beach Monitoring Program to refine testing methods and health risk assessments. *[R/CCE-2-05 (mon wq)]*

1387 NEW HAMPSHIRE: Characterizing subtidal oyster reefs using remote sensing

This project had the overall goal of assessment of new and innovative remote sensing techniques for characterizing subtidal oyster reefs, culminating in a recommended general protocol for further testing. The major techniques assessed were acoustic (sonars), underwater video, and extractive quadrat counts. The aim was to determine how far remote sensing methods (sonar and video) can be pressed to gather management-related data that have typically been gathered by techniques such as quadrat counts, dredges, or other extractive (and destructive) methods. We recognize that no single study could yield a definitive monitoring protocol for the eastern oyster. This is in part because management agencies and others involved in oyster monitoring vary widely in their objectives. A variety of factors may be involved in the decision making process: general environmental conditions such as water depth and clarity, sampling traditions in each area, economic considerations, and others. Therefore, it seems unlikely any one protocol could be widely implemented. Our project, however, has resulted in new comparative knowledge that should be useful for managers seeking to rely more on remote sensing techniques while minimizing extractive sampling methods. *[R/MED-2 (mon)]*

1414 NEW YORK: Sea Grant researchers establish a regional laboratory to monitor algal toxins in water bodies

Cyanobacterial blooms and their associated toxins have caused environmental and human health problems worldwide. To investigate the occurrence of anatoxin-a in the lower Great Lakes, nearly 1500 water samples were collected from Lakes Ontario, Erie and Champlain between 2001 and 2004, and the anatoxin-a content determined using HPLC after fluorometric derivatization. Anatoxin-a was found in 2% of the samples from Lake Ontario, 5% of the samples from Lake Erie, and 4% of the samples from Lake Champlain. Overall the anatoxin-a concentrations were low (less than 0.01 micrograms per liter), with the highest concentrations observed in Lake Champlain (6.3 micrograms per liter) and Lake Ontario (1.4 micrograms per liter). Few samples had anatoxin-a concentrations that exceeded 0.5 micrograms per liter, suggesting that despite the highly publicized animal fatalities in Lake Champlain; acute toxicity from the neurotoxic anatoxin-a is likely to be rare. Anatoxin-a was relatively unstable (half-life ~5hr) in natural waters when exposed to UV light and higher pH levels (>8) similar to those which occur during a cyanobacterial bloom. IMPACT: Instability of anatoxin-a has important implications for management because samples collected in the later stages of a bloom may underestimate the actual risk from this toxin. Thus to facilitate monitoring, the researchers established a regional monitoring laboratory for anatoxin-a, offered training workshops for outside agencies in measuring anatoxin-a, and worked to develop a rapid monitoring technique for this neurotoxin. They have developed a prototype two-step Enzyme-Linked Immunosorbent Assay (ELISA) for this toxin which is sensitive to 0.6 micrograms per liter. This new ELISA shows good correlation ($R^2 = 0.96$) with the fluorometric HPLC method when both were used to analyze natural field samples for anatoxin-a. The lead researcher is currently working with several different biotechnology firms to investigate new coupling techniques for formation of additional antibodies against anatoxin-a. [R/XO-2 (train mon hab)]

1415 NEW YORK: Sea Grant researchers have developed a quick, accurate test for botulism for one-tenth the cost of the leading traditional test

Researchers on Clostridium botulinum type E intoxications that have struck live-fish-eating birds of the Lower Great Lakes have developed a faster and cheaper quantitative PCR assay technique for the botulinum toxin gene when compared to the traditional mouse assay. IMPACT: Using this technique, the lab tested samples for type E botulism from Mississippi State University, the University of Arkansas at Pine Bluffs, and the Washington Department of Fisheries and Wildlife, charging \$10 for a one-day turnaround versus the older mouse assay method which charged \$100 and took several weeks. [R/SHH-12 (dis mon)]

479 NORTH CAROLINA: NC Local Officials Respond to Educational Programs

As a result of Sea Grant educational programs for coastal community officials on water quality, habitat degradation and other natural resource impacts associated with development, one county is critically evaluating existing zoning plan and other ordinances using a GIS-mapping and modeling exercise to predict water quality impacts of full build out. In addition, several counties have adopted low-impact development practices. [A/EA-10 (wq edu mon mod)]

1424 NORTH CAROLINA: Detecting and Quantifying Algal Blooms

Sea Grant research results have improved the means of detection, taxonomic characterization and quantification of phytoplankton bloom species, including toxic and other nuisance taxa. Field data have also been used to calibrate satellite and aircraft-based remote sensing of Chl a and other diagnostic (of phytoplankton groups) photopigments, enabling investigators and managers to “scale up” to the ecosystem level. See Paerl et al. 2003, Bioscience 53(10) 953-964. [R/MER-45 (*mon hab*)]

1466 NORTH CAROLINA: Sea Grant techniques transferred to varied research

Mass spec methods identified by Sea Grant researchers provide a means to assess success of various management strategies designed to enhance natural N removal. This approach is now integrated into a Virginia oyster restoration study to assess the validity of oyster restoration for nutrient credits. These mass spec and molecular techniques are being applied to studies of soil systems that include Nitrogen fertilizer. Finally the rapid screening tools developed by Sea Grant researchers can be applied to wider spatial and temporal assessment of Nitrogen removal hotspots in estuaries. (NCSG: Microbial Nitrogen Cycling in the Cape Fear River Estuary: Attenuation vs. Recycling and the Effects of a Variable Freshwater-Saltwater Boundary, R/MER-54) [R/MER-54 (*res wq mon*)]

25 OREGON: Oregon Sea Grant Project Discovers New Variables for Biogeochemical Modelers to Incorporate into Their Work

This study is affecting research directions regarding the role of sandy continental shelves in the biogeochemistry and ecology of the coastal ocean. Biogeochemical modelers are wondering how to parameterize this complexity. This is a relatively new field and we have generated a comprehensive dataset that spans a previously undocumented set of conditions. The work addresses a number of basic research questions and has been carried out with an eye toward identifying and minimizing diverse anthropogenic activities (for example, fishing and contaminant release) on the health of the coastal ocean. The Max-Planck-Institut in Bremen is already doing similar work, and it is anticipated that this Oregon Sea Grant project will move the science forward and lead to further discoveries on the biogeochemistry of the coastal ocean. [(*mon*)]

496 OREGON: Protecting and Conserving Oregon Groundwater Supplies through “Citizen Science”

The Oregon Water Resources Department (OWRD) in the Natural Resources Office has a vested interest in protecting and conserving Oregon groundwater supplies. The OWRD, in collaboration with Oregon Sea Grant, supported the establishment of a fellow who would develop a groundwater-level monitoring program, including the development of all training, promotional, and outreach materials; the program’s Web site; and the evaluation of this pilot program. Abigail Brown, an Oregon State University (OSU) master’s student in water resources policy and management, led this collaborative pilot project in the Eola Hills groundwater limited area, under the precept of engaging citizens in research and collection of scientific data (“citizen science”). Twenty-six people were trained to measure the water levels in their

wells at Neighborhood Groundwater Network (NGWN) workshops. Eleven of the resulting water-level measurements were entered into the OWRD online database. In this leading example of citizen science, the training materials and program design developed through this Oregon Sea Grant fellowship are already being adopted in both Benton County and the Yamhill County Soil and Water Conservation District. It is clear there is widespread interest in understanding, protecting, and measuring groundwater supplies across Oregon. An impromptu review of community groundwater-level monitoring programs across the United States indicates that such programs are rare. These types of projects could be implemented by a variety of organizations, including watershed councils, soil and water conservation districts, counties, and schools. [(mon train wq)]

2 SOUTH CAROLINA: Submarine groundwater discharge is patchy in Long Bay, SC, inner shelf.

Little information exists regarding solute exchange between land and sea in Long Bay, SC. In order to assess spatial distribution of submarine groundwater discharge (SGD) seeps, discharge rates, and dissolved chemical loads delivered to the nearshore ocean waters via SGD, a multiphase ongoing study has been undertaken by Coastal Carolina University in collaboration with South Carolina Sea Grant Consortium. Results from the preliminary electrical characterization study demonstrated that SGD seeps are likely patchy in distribution throughout the Long Bay inner shelf. SGD does not appear to be a uniform and diffuse process within the study area, but rather somewhat focused by geological controls. Comparison of continuous resistivity profiles (CRP) with seismic profiles indicates that discharge 'hotspots' are spatially co-registered with seismic structures including but not limited to: paleochannels, discontinuous reflectors (karst features?), outcropping layers, and possibly even hardbottom location. The SGD research effort has resulted in at least seven presentations at regional and national meetings. Five of these presentations have students as lead authors and presenters. Coastal Carolina University undergraduate Dimitri Quafisi (B.S., Marine Science, 2007) presented his interpretations of seep distribution at the Big South Undergraduate Research Symposium where he won an award entitled Best Abstract. Dimitri then expanded his effort to propose a conceptual model of SGD mixing as a function of increasing distance from shore and presented a poster at the spring 2007 Geological Society of America Southeast Regional meeting. In the fall of 2007 at the American Geophysical Union annual meeting, PI Viso presented findings expanding on Quafisi's work to include discharge estimates. Following the 2008 sampling season, Viso presented new findings including nutrient concentrations at the AGU fall meeting. Coastal Carolina University graduate student Heather Gregory applied nutrient concentrations to discharge estimates and presented nutrient fluxes at the spring 2009 SE regional Geological Society of America meeting in Tampa, FL. She followed up with a talk at the 2009 Southeast Estuarine Research Society meeting. Presently, Viso, Gayes, McCoy and Quafisi have a manuscript in preparation for submission to Estuarine, Coastal and Shelf Science. This manuscript will focus on preliminary geological interpretations from the CRP snapshot from year 1 (2006). Lewis, Viso, McCoy and students have another paper planned to expand upon biogeochemical aspects of the study following the upcoming 2009 sampling season. McCoy and Viso have also planned a manuscript to focus on the discharge estimates calculated from ^{222}Rn excess. [R/CP-15 (mon wq unk)]

107 SOUTH CAROLINA: In-situ acoustic instruments and fluorescence used to determine physical controls on benthic fluxes of microalgae.

Activities for this project began in August of 2008. This investigation is designed to use autonomous, in-situ acoustic instruments along with synchronized, simultaneous measurements of fluorescence to determine the possible physical controls on chlorophyll a (chl a) concentrations in Winyah Bay and North Inlet (SC). The planned data collection periods include seasonal deployments in both systems for comparison. Six minute averaged pressure data recorded during the installation shows a semi diurnal tidal oscillation characteristic of North Inlet and most East coast estuaries. North Inlet with no fresh water input is dominated by oceanic water and water levels are determined primarily by tides. The deployment occurred just prior to the peak in the spring tide and continued through the transition to neap. Harmonic analysis of the velocity components (u, along channel east, and v, cross channel north) derived from the ADVs shows the four major constituents in order to be; M2, K1, M4 and O1. Along channel velocity showed asymmetry toward ebb flow throughout the time of deployment. Maximum ebb flow velocities averaged approximately 42 cm s⁻¹ and varied only slightly with the transition to spring tide. Flood tide velocities into the marsh showed a narrow range of 12 to 15 cm s⁻¹. Asymmetry in channel velocities is an expected feature of the marsh being observed in previous investigations in North Inlet (Voulgaris and Meyers, 2004). Two, unequal daily peaks in chl a are evident over the displayed time series, though the overall magnitude of the peaks diminish with time probably due to biofouling. Peaks in chlorophyll appear to occur at low water only and close to slack water. The larger peaks in chl a concentration occur concurrently with Total PAR peaks (Total PAR data for the deployment period were downloaded from the Baruch Marine lab website, Oyster Landing NERR platform, <http://links.baruch.sc.edu/weather.htm>), however, the smaller peak occurs in the absence of light. The maximum in chl a concentrations, though influenced by light, appears to correlate more closely with low water and maximum in ebb flow channel velocity. The next goal will be a longer deployment of the observation tripod in the tidal creek covering an entire spring-neap transition. Special attention needs to be placed in preventing signal deterioration due to biofouling. [R/CP-16 (mon wq)]

581 SOUTH CAROLINA: SC Sea Grant extension activities promote community understanding of coastal issues and how they can be managed.

Assistance with Comprehensive Land-Use Planning: As part of CGI, a small grants program, the S.C. Coastal Community Initiative Grant Program (SCCCI) was established to provide an incentive to engage local governments in the development and implementation of “equality growth” land management policies and practices. Two important objectives of this grant program are for participating coastal communities to make a commitment to working with the SCSGEP to understand “equality growth” principles and to seriously consider incorporating one or more of these principles into local land use plans and policies. On a yearly basis, proposals have been solicited from coastal municipalities and counties to participate and to date, six coastal communities have received SCCCI grants ranging from \$2500 to \$5000 to address a variety of issues related to open space preservation, natural resource-based planning, water quality management, alternative transportation, sustainable community planning and design, and zoning ordinances and regulations. Since the inception of the SCCCI more than \$60,000 has been leveraged by the communities participating in the grants initiative. Maintain Existing and Establish New Linkages and Collaborative Partnerships: The S.C. Coastal Information Network (SCCIN) emerged as a result of a number of coastal outreach institutions and constituencies working in partnership to enhance coordination of the coastal community outreach efforts in South Carolina. This organized effort, led by the S.C. Sea Grant Extension Program and coordinated by the Coastal

Communities Specialist, includes partners from federal and state agencies, regional government agencies and private organizations seeking to coordinate and/or jointly deliver outreach programs that target coastal community issues. The purpose of this collaboration is to avoid duplication of efforts and minimize the number of meetings/workshops that community leaders and staff are asked to attend, leverage scarce resources, maximize program benefits and expected outcomes. To facilitate communication and coordination, Network partners have created a member list serve and developed a web site (www.sccoastalinfo.org) with a searchable database calendar of all participating partners'™ outreach events in coastal South Carolina SCNEMO and Other Related Water Resources Management Programs: The CC specialist is the outreach project coordinator for the Biennial Sea Grant Program project, "An Assessment of Stormwater Best Management Practices for Coastal South Carolina: The Oak Terrace Preserve Monitoring Project". The project purpose is to evaluate the efficiency and efficacy of innovative stormwater management practices and these evaluations will be used to improve the understanding of hydraulic changes through construction phasing (which is significant to developing regional stormwater management techniques). The outreach team members are tasked with promoting public awareness and understanding of watershed concepts and the link between development and water quality through outreach education programs and products. As coordinator of the outreach component of the project, the CC specialist has been involved in the development of NPS fact sheets, focus group workshops, and bioswale demonstration workshops. The SCNEMO Team continued the process of revising the SCNEMO Program, with particular attention being paid to enhancing the program's principles and strategies with local scientific research (science infusion). The CC specialist with the help of the Assistant Director of Research and Planning organized and convened a meeting with local scientists to discuss how to infuse/incorporate their research results and information into the SCNEMO program. Coastal Access/Waterfront Diversity Investigative Study: In collaboration with the S.C. Sea Grant Extension Program Fisheries Extension specialist and a contracted marine resource economist (Ray Rhodes), the CC specialist contributed to a study investigating water access challenges and opportunities for water dependent marine fishing stakeholders - both commercial and recreational. Conducted an in-depth study investigating the current state of waterfront access for commercial and recreational fishing stakeholders in coastal South Carolina. The study included an extensive literature search and compilation, as well as one-on-one interviews with diverse stakeholders including commercial and recreational fishermen, state-level fishery managers and coastal resource managers, county-level planning staff, commercial fishing dock owners and recreational fishing pier operators. The goals of the study were to determine the current state of waterfront access in coastal S.C. and any surrounding waterfront access issues, to provide examples of local waterfront access initiatives occurring in the state, and to identify existing and new tools for addressing waterfront access issues in the state. The study was completed in 2008 and the report is available for download from the S.C. Sea Grant Web site. "The Waterfront Access Report" - outlined current trends in waterfront access for commercial and recreational fishing/boating sectors, as well as coastal development trends. Based on stakeholder interviews, summaries of current S.C. initiatives and the tools used to implement maintenance or preservation of waterfront access for fishing purposes were compiled. Also as part of the report, a comprehensive resource list of other waterfront access initiatives across the nation was compiled and a glossary of acquisition-based and non-acquisition based tools used by communities was developed. South Carolina Nature-Based Tourism Association (SCNBTA): The CC specialist continued to interact with the SCNBTA members, attending annual board meetings, as well as SCNBTA annual conferences, and seminars during the reporting period. The CC specialist continued to serve on the SCNBTA Board of Directors (since 2007), as well as the conference/workshop planning committee. The CC specialist is responsible for coordinating the newly redesigned Web site, which includes generating and distributing monthly and quarterly Web site statistical analysis reports and monitoring the site for broken links and necessary updates. Linking Land-Use Planning with Hazards Planning: The CC specialist

continued to participate on two of the Charleston County Project Impact Committees throughout the project period. The S.C. Coastal Information Network (SCCIN) is in the preliminary stages of organizing three information sessions for coastal decision-makers in the upcoming months to discuss the potential impacts of shoreline change in South Carolina, including beachfront and estuarine shorelines. Experts on shoreline change will present the current status of climate, sea level, and shoreline change in South Carolina and initiate a public discussion and exchanging of ideas at the local level. Following the informative presentations and facilitated breakout group sessions, participants will identify the next steps to help prepare communities for the impacts of shoreline change. *[A/CG-1 (cli wq mon)]*

458 WASHINGTON: Sea Grant Funds Lasting Industry Innovation in Underwater Acoustics

Sea Grant supported application of acoustics technologies in commercial fisheries in the early 1970s. As a result, Sea Grant is credited with creation of the University of Washington's marine acoustics program and the formation of the company BioSonics, Inc., in 1978. The company pioneered the application of hydroacoustic technology to locate, identify, count and track fish. This technology has been used in monitoring biological and physical features in both freshwater and marine environments around the world, and has been a critical tool in managing Columbia River salmon and Northwest herring populations. The company's techniques have increased annual catches and helped establish catch quotas to avoid overexploitation in both the salmon and herring fisheries. Impact: BioSonics, Inc.'s services and products currently are used for a variety of underwater acoustic applications by 34 agencies and tribes, 13 utility companies, 21 consulting firms, and 27 universities or institutes at the federal, state, and local levels in the United States, and by 61 international institutions. More information is available online (<http://www.biosonicsinc.com>). *[(mon)]*

1617 WASHINGTON: Sea Grant Research Assesses the Role of Ocean Conditions in the Decline of Steelhead Runs on the West Coast

Dwindling runs of anadromous steelhead (*Oncorhynchus mykiss*) have led to harvest reductions and job losses in recreational and tribal fisheries and related businesses. Although millions of dollars are being spent to protect and restore steelhead populations and their freshwater habitats, recent large and unpredictable fluctuations in runs may be due to changes in ocean conditions. Thus, it is difficult to assess the effectiveness of rebuilding efforts without understanding how ocean-climate processes regulate steelhead abundance. Sea Grant research created a long-term biological database (1955-2009) on steelhead in the North Pacific Ocean and mapped known ocean distributions and associated environmental conditions. Preliminary results show decadal-scale changes in the amount of critical thermal habitat for steelhead, which increased from 1960-1990 and has decreased since then. Impact: By harnessing a long-term dataset to address critical gaps in steelhead ecology, Sea Grant research is strengthening the scientific basis for management - especially critical when open ocean conditions are unfavorable for steelhead survival. *[R/F-160 (ebm mon res)]*

1680 WOODS HOLE OCEANOGRAPHIC INST.: Sea Grant provides natural resource managers with a novel habitat assessment tool

Sea Grant helped develop a quantitative measure of shellfish habitat assessment and worked collaboratively with Cape Cod natural resource managers to demonstrate the utility of this tool in guiding management decisions. Impact: This assessment tool has been adopted by natural resource managers in 4 municipalities and demonstrations have been requested in three other towns. *[A/M/O-2 (mon)]*

1682 WOODS HOLE OCEANOGRAPHIC INST.: Sea Grant tracks the spread and intensity of shellfish diseases

Sea Grant has provided ongoing monitoring of shellfish diseases, including a coastal survey in 2006 of the most common oyster diseases. Samples were collected from over eleven locations. Impact: Timely knowledge of the status of diseases allowed natural resource managers and shellfish farmers to increase harvest, helping avert financial losses in excess of \$50,000. *[A/M/O-2 (dis mon)]*

213 CALIFORNIA: Humboldt Bay Cooperative Eelgrass Project

The results of our survey have been useful to shellfish growers in their permit applications. Local managers also use the results when applications for culvert replacement, levee replacement, and highway repairs impact eelgrass. I reviewed two proposals for their eelgrass mitigation and monitoring methods and gave my scientific opinion on technical aspects such as sample size, distance between transects, and timing of sampling. From Test Bed data, I could show that sampling between April and September would be more useful as this is the growing season for *Z. marina* in Humboldt Bay. Data collected from monitoring sites at other times of year would be difficult to analyze. Our survey results were used to develop eelgrass monitoring plans for two projects, the Eureka Marsh Culvert Replacement and Mad River Slough Levee repair. [*(mod res mon)*]

1150 CALIFORNIA: Ecosystem-Based Management

Findings from the project were used in the California Marine Life Protection Act (MLPA) Initiative process for developing potential marine reserve designs in the Gulf of the Farallones-Cordell Bank region. The researchers formulated conservation and management recommendations to protect the marine food webs in this region. They provided distribution and abundance maps of marine birds and mammals (to show areas of high importance); they developed statistical models to understand these observed distributions and abundances in relation to krill abundance, oceanographic conditions and local physiography; and they proposed design considerations for marine protected areas in the Gulf of the Farallones-Cordell Bank region. [*R/CZ-202 (prot mon mod ebm)*]

1178 CALIFORNIA: Modeling Coastal Processes

We have identified several general categories of users who will benefit from the results of this research: The modeling capability can be used in a predictive mode by local, state, and federal environmental regulators currently setting standards for non-point storm water runoff and Total Maximum Daily Loads for inland streams that discharge to the ocean and for atmospheric emissions. The research will also benefit the operators of municipal and industrial facilities that discharge into impacted embayments who need to understand the impacts of their respective discharges. The research will assist EPA and other regulatory agencies in evaluation of alternative schemes for remediation of contaminated coastal sediments, such as the DDT patch near Santa Monica Bay, currently the focus of a federal Superfund effort. The research will be useful to marine scientists trying to understand how the physical and biogeochemical processes in enclosed embayments interact with the natural aquatic ecosystem. The research will be useful to marine scientists trying to understand where to site marine protected areas. The research will assist scientists in understanding the causes and characteristics of harmful algal blooms in the coastal region. [*R/CZ-193 (prot wq mod res mon)*]

156 CONNECTICUT: Connecticut Sea Grant Partners Develop CT Aquatic Nuisance Species (ANS) Management Plan

Addressing aquatic plants, freshwater vertebrates and invertebrates, and marine species, the plan implements a coordinated approach to minimizing the ecological, socioeconomic and public health

impacts of ANS in the State of Connecticut, and coordinates ongoing and new research, educational, monitoring, and regulatory efforts to focus on commonly-identified priorities, strategies, and tasks. Drafted jointly by CTSG, CT DEP, and the CT Institute of Water Resources, with input from numerous stakeholders, the plan was signed by the Commissioner of DEP and Governor M. Jodi Rell in March 2007. It subsequently received approval of the federal ANS Task Force in May 2007. Impact: • Connecticut now has a blueprint for management, research, and outreach that outlines priority goals, objectives and actions for a five-year period. As the plan is implemented, CT will benefit from a comprehensive and coordinated approach to address early detection and monitoring, rapid-response, control and eradication, spread prevention, and policy / legislative needs with respect to aquatic nuisance species in a timely manner. Coupled with appropriate research to address local/regional problems and educational programs targeted at a range of audiences to raise awareness of the issue, the result should be more efficient use of available resources to address priority ANS problems in CT, better coordination among involved parties, and a greater awareness of the problems ANS cause locally, nationally, and globally. • CT DEP applied for and was awarded an equal share (\$43K) of the federal funds available to support the implementation of state management plans in 2008. A job description for a state invasive species coordinator with CT DEP is complete; a state hiring freeze has delayed the filling of the position. [*ebm soc wq mon inv*]]

105 DELAWARE: DESG Scientists Test Integrated Coastal Observing System

This Sea Grant project provided funds toward the monitoring of currents in the vicinity of the Delaware Bay mouth as part of an effort to discern vertical and lateral variability in bay-mouth flow. This information is crucial to the understanding of the coupling and exchange between Delaware Bay and the adjacent continental shelf. This project was conducted in support of two ongoing research initiatives within the University of Delaware College of Earth, Ocean, and Environment. First is the establishment and maintenance of an integrated ocean observing system at the Delaware Bay mouth. This system and related data collection were proposed by Wong, Badiey, and Trembanis in the this Delaware Sea Grant proposal: Monitoring variability in tidal and wind-driven transport in Delaware Bay with an integrated coastal observing system. Second, this project helped support an investigation by the Skarke and Trembanis of the relationship between bedform geometry and hydrodynamic forcing on Hen and Chickens Shoal. [*R.ETE-10 (mon mon)*]]

106 DELAWARE: Surface currents around the US coast

Surface currents around the US coast are now routinely archived on a national HF radar data archive server. These near real-time measurements have already been integrated into the US Coast Guard search and rescue planning effort. This Sea Grant project provided funds toward the establishment, testing, and initial operation of the three HF radars monitoring currents in the vicinity of the Delaware Bay mouth as part of this national effort. [*R/ETE-8 (mon mon)*]]

116 DELAWARE: DESG Study Deploys New Micro-Electrode for Use in Long-Term Observing Systems

Researchers have developed new types of microelectrodes for biogeochemical measurements made at coastal observing systems. Data from the new electrodes can be transmitted from a mooring in

Delaware Bay to a shore-based laboratory via radio telecommunication. Results from the mooring showed that dissolved oxygen concentrations in lower Delaware Bay are above saturation throughout the year. Impact: Suitability of the new electrodes fixed moorings has been clearly demonstrated. The Delaware Bay Observing System has been enhanced. *[R/ECO-4 (mon)]*

1232 DELAWARE: DESG Study Deploys New Micro-Electrode for Use in Long-Term Observing Systems

Systems: Researchers have developed new types of microelectrodes for biogeochemical measurements made at coastal observing systems. Data from the new electrodes can be transmitted from a mooring in Delaware Bay to a shore-based laboratory via radio telecommunication. Results from the mooring showed that dissolved oxygen (O₂) concentrations in lower Delaware Bay are above saturation throughout the year. Air-sea gas exchange rates and net O₂ production rates (primary productivity and respiration) were also calculated using the measured dissolved oxygen concentrations, wind speed, and tidal currents. O₂ production was modeled using the Delta method and a primary productivity and respiration model. Based on these calculations, the lower Delaware Bay was net autotrophic during the summer of 2007, producing O₂ at a rate of 2.8 micromolar d⁻¹ over the well-mixed 15 m water column. Impact: Suitability of the new electrodes fixed to moorings has been clearly demonstrated. The Delaware Bay Observing System has been enhanced. Sea Grant research documented the complexities present at the interface between estuaries and the coastal ocean. These results demonstrate the need for time series studies in marine systems, where complex physical and biogeochemical processes would be overlooked by discrete, infrequent observations using traditional sample collection methods. When combined with modeling techniques, time series studies provide a tool to investigate and predict processes occurring in natural systems in real time. *[R/ECO-4 (mod mon)]*

1242 FLORIDA: Improved portable water quality testing device

The portable, handheld device improved through this project and used to test water samples for a variety of problematic bacteria groups offers the potential for more advanced water quality monitoring. *[R/C-E-52 (mon wq)]*

1323 MAINE: Sea Grant aids NOAA's oil spill forecasters

Oil spill researchers/forecasters from NOAA's Pacific Marine Environmental Lab indicated a need in 2006 for wave-induced surface drift velocities that NOAA can access when needed. Such a module was developed and added to the web site, and these forecasts are also now provided *[R/04-05 (mod mon)]*

1343 MARYLAND: Research provides new sensor application for real time data acquisition from small boats

Maryland Sea Grant research funding supported development of real time urea sensor system deployed from small boats currently being used in Maryland and by Florida Fish and Wildlife Institute for water quality monitoring and research. *[R/WQ-3 (wq mon)]*

1346 MASSACHUSETTS: Low-power autonomous sampling of plankton and particles.

We have developed a small, low-power, digital holographic camera that images plankton and particles in the size range from microns to centimeters. We also have developed image analysis methods for accurate automated identification of plankton from images. These advances pave the way for incorporation of small compact imaging systems, with on-board plankton identification, into ocean gliders and drifters. This new capability will allow remote sampling of plankton throughout the world ocean. [R/RT-2/RD-28 (mon)]

1519 RHODE ISLAND: New tool for circulation dynamics of Narragansett Bay.

The primary impact has been the development of an important new tool for understanding circulation, transport, flushing, etc of the Narragansett Bay ecosystem. Coupled with this is the collection of 8 months worth of circulation and hydrography data during two different years with 4 ADCP stations and collection of spatially detailed underway ADCP data in the mid-Bay region. This is the most comprehensive physical data set that exists for the Bay. The combination of the calibrated ROMS model with these new observational data sets provide the framework for using ROMS as a management tool for local managers. The ROMS model developed on this project represents an ecosystem management tool. ROMS itself is a technology which has been developed and applied to our local estuary. However, the combination of modeling/data collection activities on this award has led to technical advances in terms of designing observational networks for capturing the temporal-spatial variability in systems with complex geometries, like Narragansett Bay. Modeling results highlight how inadequate conventional technologies are at capturing circulation features recorded in the ROMS Bay models. Pathlines for modeled passive floats moving in the flow fields reveal the formation of gyres which limit water exchange from systems like Greenwich Bay. Underway surveys cannot resolve these features. Moored arrays could completely miss gyre boundaries and the drift of gyre boundaries. This work has led to a collaboration between URI and a local business Bluewater Designworks to develop a new class of shallow water floats. [R/P-061 (mon mod ebm)]

107 SOUTH CAROLINA: In-situ acoustic instruments and fluorescence used to determine physical controls on benthic fluxes of microalgae.

Activities for this project began in August of 2008. This investigation is designed to use autonomous, in-situ acoustic instruments along with synchronized, simultaneous measurements of fluorescence to determine the possible physical controls on chlorophyll a (chl a) concentrations in Winyah Bay and North Inlet (SC). The planned data collection periods include seasonal deployments in both systems for comparison. Six minute averaged pressure data recorded during the installation shows a semi diurnal tidal oscillation characteristic of North Inlet and most East coast estuaries. North Inlet with no fresh water input is dominated by oceanic water and water levels are determined primarily by tides. The deployment occurred just prior to the peak in the spring tide and continued through the transition to neap. Harmonic analysis of the velocity components (u, along channel east, and v, cross channel north) derived from the ADVs shows the four major constituents in order to be; M2, K1, M4 and O1. Along channel velocity showed asymmetry toward ebb flow throughout the time of deployment. Maximum

ebb flow velocities averaged approximately 42 cm s⁻¹ and varied only slightly with the transition to spring tide. Flood tide velocities into the marsh showed a narrow range of 12 to 15 cm s⁻¹. Asymmetry in channel velocities is an expected feature of the marsh being observed in previous investigations in North Inlet (Voulgaris and Meyers, 2004). Two, unequal daily peaks in chl a are evident over the displayed time series, though the overall magnitude of the peaks diminish with time probably due to biofouling. Peaks in chlorophyll appear to occur at low water only and close to slack water. The larger peaks in chl a concentration occur concurrently with Total PAR peaks (Total PAR data for the deployment period were downloaded from the Baruch Marine lab website, Oyster Landing NERR platform, <http://links.baruch.sc.edu/weather.htm>), however, the smaller peak occurs in the absence of light. The maximum in chl a concentrations, though influenced by light, appears to correlate more closely with low water and maximum in ebb flow channel velocity. The next goal will be a longer deployment of the observation tripod in the tidal creek covering an entire spring-neap transition. Special attention needs to be placed in preventing signal deterioration due to biofouling. [R/CP-16 (mon wq)]

1561 SOUTHERN CALIFORNIA: Sea Grant research enables prediction of phytoplankton bloom response by identifying transport of suspended fine particulates in nearshore waters

Research generated by collaborations with ECOHAB and MERHAB programs studying harmful algal blooms by analyzing remote sensing observations has been correlated with field based studies, allowing for watershed modeling that allows prediction of the likelihood of potential threats to human and ecosystem health. [R\ CE-13 (hab mon mod)]

1642 WASHINGTON: Sea Grant supports tools to detect toxic algae and predict harmful algal blooms

Heterosigma blooms create toxic conditions for marine ecosystems and aquaculture by forming dense surface aggregations. The aggregations are caused in part by cells' vigorous swimming behaviors that interact strongly with estuarine flows to concentrate or disperse potential HABs. Heterosigma cells transition into resting cells (cysts) when environmental conditions become unfavorable; transitioning cells are believed by aquaculturists to be highly toxic to penned fish, and cysts are sources of future HABs. Sea Grant research has developed three techniques to address Heterosigma blooms: (1) video- and computer-based techniques to automatically quantify the number and sinking rates of transitioning cells and cysts in water samples; (2) an inexpensive optical imager that can quantify swimming characteristics of Heterosigma cells in their natural environment; and (3) computationally efficient methods to estimate transport of algal cell populations due to diurnal shifts in swimming behavior and seasonal or tidal changes in estuarine flows. Impact: These tools respectively provide: (1) a basis for assessing toxicity due to transitioning cells and predicting the abundance and location of cyst beds that may cause future HABs; (2) fine-scale observations of cell distributions and behaviors that offer an accurate basis for prediction of HAB location and timing; and (3) an efficient and effective tool for determining the conditions likely to promote HAB formation in estuarine environments. [R/B-52 (mon hab)]

213 CALIFORNIA: Humboldt Bay Cooperative Eelgrass Project

The results of our survey have been useful to shellfish growers in their permit applications. Local managers also use the results when applications for culvert replacement, levee replacement, and highway repairs impact eelgrass. I reviewed two proposals for their eelgrass mitigation and monitoring methods and gave my scientific opinion on technical aspects such as sample size, distance between transects, and timing of sampling. From Test Bed data, I could show that sampling between April and September would be more useful as this is the growing season for *Z. marina* in Humboldt Bay. Data collected from monitoring sites at other times of year would be difficult to analyze. Our survey results were used to develop eelgrass monitoring plans for two projects, the Eureka Marsh Culvert Replacement and Mad River Slough Levee repair. [*(mod res mon)*]

1132 CALIFORNIA: California Beach Health

This project has already had important impacts for habitat monitoring on sandy beaches and for the involvement of a variety of stakeholders in management practices. The California Grunion is now considered a Species of Special Concern and the sandy beach is considered Essential Fish Habitat according to the Magnusen-Stevens Act, as interpreted by the National Marine Fisheries Service and the California Department of Fish and Game. Citizen scientists from coastal California have been trained and have provided extensive data for an understudied species, and their commitment has extended beyond this one species to a sense of stewardship for the coastal habitat. The National Marine Fisheries Service- Southwest Region, Habitat Conservation Division has funded Grunion Greeter monitoring efforts in 2008 and plans to continue the work in future years. New management practices are in place throughout the habitat range of the grunion as a result of this work. The PI has evaluated habitat concerns for numerous agencies including California Coastal Commission, National Marine Fisheries Service, California Department of Fish and Game, Los Angeles Beaches and Harbors, California State Parks, the Goleta Beach restoration for the County of Santa Barbara, and ocean outlets in the County of Orange. The data were used in the assessment of the effects of the Cosco Busan fuel spill in San Francisco Bay. Numerous environmental organizations including Surfrider Foundation, Heal The Bay – Santa Monica, Santa Barbara Channel Keepers, and the Audubon Society are involved in grunion studies. Aquariums including Cabrillo Marine Aquarium, Birch Aquarium at Scripps Institution of Oceanography, the Roundhouse Aquarium in Manhattan Beach, the Aquarium of the Pacific in Long Beach, and the Ty Warner Sea Center of the Santa Barbara Museum of Natural History have grunion displays and programs as part of their mission. Several State Parks have initiated new public programs for grunion runs at their sites, including San Elijo State Beach, Bolsa Chica State Beach, Doheny State Beach, and Crystal Cove State Beach. Based on the efforts of the Working Group for beach managers and field operators, we are initiating the formation of a nonprofit organization. The focus will be to develop and disseminate best practices for beach management to balance wildlife conservation and recreation. [*R/CZ-195 (mon end train)*]

222 CONNECTICUT: Sea Grant Collaborates on Dune Restoration

Connecticut Sea Grant, working with a local land trust and several private companies, restored an active dune system of 750 ft bordering Long Island Sound after two spring storms severely eroded the dune system in 2007. A plan was developed to restore the dunes using Filtrex tubing - an erosion control

material which had not previously been used in a coastal environment. Donations of materials, equipment use, and expertise reduced the total cost of the restoration project total cost to ~\$30,000, one-third of what it would have otherwise cost. After seeing the success of this restoration project with the Filtrex tubing, the Connecticut Department of Environmental Protection decided to use the same methodology and materials on an eroding dune system at a state park on the coast. [A/E-1 (res mon)]

116 DELAWARE: DESG Study Deploys New Micro-Electrode for Use in Long-Term Observing Systems

Researchers have developed new types of microelectrodes for biogeochemical measurements made at coastal observing systems. Data from the new electrodes can be transmitted from a mooring in Delaware Bay to a shore-based laboratory via radio telecommunication. Results from the mooring showed that dissolved oxygen concentrations in lower Delaware Bay are above saturation throughout the year. Impact: Suitability of the new electrodes fixed moorings has been clearly demonstrated. The Delaware Bay Observing System has been enhanced. [R/ECO-4 (mon)]

219 DELAWARE: DESG Researchers Develop Molecular Monitoring Tools for Oyster Stock Enhancement Efforts

DESG Researchers Develop Molecular Monitoring Tools for Marine Water Quality Testing. Developed and optimized molecular testing protocols for pathogen and fecal indicator bacteria. Worked in collaboration with the state's environmental monitoring agency (DE DNREC) and the SG Citizen's Monitoring Program to compare the new technique vs standard tests for total Enterococcus. The new techniques are more sensitive and more specific. Impact: This tool extends the capability of the Delaware's state monitoring agency for detecting the presence of harmful bacteria. It can be applied in waters beyond Delaware. [R/BT-1 (mon wq wq)]

495 LAKE CHAMPLAIN: Sea Grant helps businesses reduce phosphorous in stormwater runoff

Statement: Commercial landscapes account for significant proportions of total lawn area in impaired urban/suburban watersheds in the Lake Champlain Basin. Often ignored in NPS pollution reduction efforts, LCSG continues to work with managers of business and institutional properties to promote the adoption of low input/no phosphorous grounds care through one on one educational activities and technical support. Impacts: An August 2007 survey showed property managers participating in the Burlington pilot project (responsible for an estimated reduction in annual phosphorous loads in runoff of between .45 and .91 metric tons/yr.) were continuing low input practices after 3 years. Training and assistance provided to property managers lowered barriers to adopting or maintaining BMP for sustainable grounds care on over 128 acres (65%) of priority commercial/institutional lawn area in the Stevens and Rugg Brook watersheds in St Albans, VT. Reduced stormwater runoff volume, and reduced erosion and sediment transport were evident after the first season. Monitoring of runoff volumes, suspended sediment and phosphorous will quantify the impacts. [(mon train wq)]

227 MAINE: York takes action to protect water quality

The town of York's sandy beaches are an integral part of the local economy, yet several beaches periodically experience high bacteria levels, forcing swim advisories. Town officials, working with the Maine Healthy Beaches program, created a new position for a Shoreland Resource Officer. This new position has allowed the town to be proactive by expanding its water quality program beyond the shoreline to include the upstream watersheds. In addition, with help from the U.S. EPA, beach monitors collected and analyzed additional water samples to identify the source of pollution in the Cape Neddick River. When these results were presented to the town by the beach manager and the Shoreland Resource Officer, the York Selectmen unanimously voted to track down and remediate land-based sources of pollution. *[A/08-01 (wq wq mon ebm)]*

569 MAINE: Beach managers use volunteer data to make decisions

Working with the Maine Department of Environmental Protection and Maine Geological Survey, many towns used data from the Maine Beach Profiling Program in 2008. At Willard Beach in South Portland, profiling data helped inform dune restoration and access improvements. Scarborough was able to evaluate seawall replacement options at Higgins Beach, and to evaluate beach nourishment performance at Western Beach. Saco assessed accelerated erosion rates and potential mitigation at Ferry Beach. Wells evaluated a nourishment project at Wells beach, and used data in their permit application for seawall improvements. Finally, Ogunquit data helped illustrate discussions of sand fence replacement and piping plover management. The value of beach profiling data generated by program volunteers is clear from the \$4,900 contributed by the towns of Ogunquit, Kennebunk, Kennebunkport, and the cities of Biddeford and South Portland, as well as the Maine Department of Conservation to support the program. *[A/08-01 (mon res)]*

1331 MAINE: Sea Grant helps town clean up its water and beaches

Despite unsafe bacteria levels for recreational water users, the state had decided not to manage the Lincolnville Beach area due to lack of staff resources. Based on monitoring by the MET and Maine Healthy Beaches Program, and the success of previous work in cleaning up contamination in area waters, the Town of Lincolnville decided to make Ducktrap Beach a priority recreational asset and a priority for management, and committed to working with MET to identify contamination sources. Town voters approved the plan, and the state gave the 25-acre beach area to the town as a 25-year free lease. *[A/EXT-06 (mon wq res)]*

1341 MARYLAND: Improved incident light algorithms resulted in a modification of the SAV water quality criteria used by management in the Chesapeake Bay

Research funding supported development of an optical water quality model to predict the diffuse attenuation coefficient for PAR based on commonly monitored water quality variables in the Chesapeake Bay. The results of this research were incorporated into the web version of the diagnostic tool for setting water quality targets for restoration of SAV used by managers in state and federal agencies throughout the Chesapeake Bay region. *[R/P-53 (wq res mod mon)]*

1386 MISSISSIPPI/ALABAMA: Sea Grant researchers assess estuarine populations to provide managers with decision making information.

Knowledge of status and trends in abundance of commercially exploited species is a key component of management. Management agencies usually operate with limited state funding to collect, analyze, and interpret data. The current project provided the opportunity to use advanced statistical techniques to analyze archived fisheries data for the states of Mississippi and Alabama. This work is a starting point toward understanding the incremental impacts of human population growth and industrial development on fisheries productivity and the development of strategic plans for mitigation of causative factors. Impact: The Mississippi Department of Marine Resources (MDMR), the Alabama Department of Conservation and Natural Resources, Marine Resources Division, the Mobile Bay National Estuary Program and the Gulf State Marine Fisheries Commission Blue Crab Subcommittee and Technical Coordinating committee has reviewed and interpreted this data. Managers can use this model to discern causes for declining population trends. Based on the findings of this study, the MDMR formed a committee to update sampling protocols and initiated a comprehensive program to address monitoring issues and other state agency managers have the tools needed to make informed decisions and take the necessary action to better manage a changing habitat. [R/SP-16 (*ebm mod mon*)]

233 NORTH CAROLINA: Tools to Identify Nitrogen Role in Estuaries

Two products are expected from North Carolina Sea Grant research regarding nitrogen in the estuaries. First, The N removal maps for the CFRE and NRE will indicate the presence of N removal hot spots in the estuaries. Second, by optimizing Q-PCR protocols of hzoAB genes, a lower cost and fast screening tool will be designed to predict the contribution of anammox in N capacities in various aquatic ecosystems. The researchers also expect to complete/refine N removal capabilities of the two estuaries based on anammox and denitrification. This knowledge will permit better estimation of ecosystem N residence time hence providing estuary-specific timescales for water quality improvements following N loading reductions. Additional end-users include city and/or town planners located along these estuaries. Identification of N removal hot-spots can be considered when determining locations and sizes of future wastewater inputs. [R/MER-57 (*mon mod eq ebm*)]

262 NORTH CAROLINA:

North Carolina Sea Grant researchers determined the relative ecological impacts of different types of erosion-control structure types -- results shared with the N.C. Division of Coastal Management (DCM) and N.C. Coastal Resources Commission, which are expected to set regulations for such structures. The Sea Grant researcher and staff erosion control specialist have served on a state workgroup to develop recommendations on erosion-control structures. The research results also were part of a conference hosted by DCM, N.C. Division of Marine Fisheries and NOAA's Beaufort Lab to explore the topic with managers, scientists, elected officials and citizens. (NCSG: Effects of Erosion Control Structures on Adjacent Benthic and Nektonic Communities, R/MER-48) [(*ebm mon*)]

255 OREGON: Oregon Sea Grant Pilot Project Brings About AIS Monitoring Protocols

A lack of AIS protocols posed both a serious potential problem for spreading AIS into Oregon's healthy watersheds. For Sea Grant it was an opportunity. OSG developed trainings, guides and monitoring and reporting protocols. The US Forest Service and the USDI BLM Aquatic and Riparian Effectiveness Monitoring Program (AREMP) from California to Washington tested our protocols during the summer of 2007. The evaluation and success of the program has resulted in a formal adoption of an expanded AIS monitoring protocol into all of the agencies aquatic monitoring programs from British Columbia border to Point Reyes, California. This is seen as model by the multi-agency PNAMP, (Pacific NW Aquatic Monitoring Program) responsible for coordinating aquatic health monitoring for natural resource agencies in the NW. These monitoring efforts will not just help in early detection, but also help in preventing further movement and allow for effective control and prevention programs to minimize the impacts from aquatic invasive species. [A/ESG-7 (*inv train mon*)]

319 SOUTH CAROLINA: Instrumentation deployed to understand sediment flow patterns as they relate to beach renourishment.

Preliminary data analysis has shown that sediment suspension and transport occurs frequently on the hard bottom reefs on the shore face and inner-shelf region during small to moderate meteorological events (winds greater than approximately 10 m/s). In addition, sediment thickness on the hard bottom reefs has been shown to be variable on time scales such as days to months. All instrumentation was deployed July 1st, 2009, and has been collecting continuous times series data over four 6-8 week deployments. The instrumentation is currently deployed at the site and continuous deployments will continue throughout the year 2009. Additional data analysis efforts are being undertaken to address (1) constraining the environmental forcing resulting in along-shelf vs. across-shelf transport of sediment (2) determining the frequency and magnitude of these transport components and (3) relating the temporal variability of sediment transport measured in between geophysical surveys to the observed spatial changes. [R/CH-1 (*mon wq mon*)]

246 TEXAS: Texas Sea Grant monitors wetland project at Brays Bayou for stormwater treatment (2009)

2009 - Wetland Restoration Team efforts continued on the award-winning Brays Bayou stormwater treatment wetland project. This wetland project has received much local attention after winning a Gulf Guardian Award for partnership in 2006 and being featured on local news programs regularly since its completion. The Wetland Restoration Team continued to collect monthly water quality monitoring data (temperature, water clarity, conductivity, dissolved oxygen levels, E. coli presence and quantity) to evaluate the success of the wetland. Collected data suggests this wetland system successfully treats bacteria and other pollutants from runoff. [A/F-12 (*res mon wq*)]

1589 WASHINGTON: Sea Grant Develops Tools to Determine Sources of Shellfish Contamination

Shellfish growing areas in Puget Sound are classified as suitable for harvest based on sanitary surveys and fecal coliform monitoring. Sea Grant researchers developed a novel F+ RNA coliphage genotyping

assay to differentiate between human and animal sources of fecal contamination. Impact: Newly developed fecal coliform indicators assisted the WA Department of Ecology, the Squaxin Tribe, and local shellfish growers to identify sources of shellfish contamination and develop appropriate management strategies for shellfish growing areas. *[R/A-84 (Prog Dev) (mon wq)]*

1638 WASHINGTON: Sea Grant supports assessment and public understanding of dam removal impacts

Dam removal projects have become a popular approach to restoring the habitats of river ecosystems. As a dam ages over time, its negative impacts on river and nearshore communities may outweigh its benefits. However, the full range of effects from restoration is not fully understood. Sea Grant research has collected high-resolution bathymetry, seabed-characterization and sediment-transport data on the Elwha River delta to begin investigations on the dispersal of dam-impounded sediment into the surrounding ecosystem. The information also is being used in public outreach to explain environmental forces that cause sediment to move and cause erosion and deposition. Impact: Agencies involved in baseline monitoring prior to the Elwha Dam removal are making use of Sea Grant data as detailed bathymetry and surficial-materials maps in their assessment of existing habitats. In addition, the public has a better understanding and access to more information to make important decisions on restoration projects. *[R/ES-65 (res edu mon mod)]*

488 WISCONSIN: Sea Grant partners with Miller Brewing Company to improve Bradford Beach

Our lab, together with Miller Brewing Company and the Milwaukee Metropolitan Sewage District, collaborated with Milwaukee County Parks in their application for a Blue Wave Award, which is given to beaches meeting certain quality criteria. Our research contributes to both monitoring and remediation aspects of this goal. Miller Brewing Company is investing \$500,000 into improving Bradford beach, \$100,000 of which is directed to the GLWI to fund additional monitoring of the sand, buoys, a web cam, and signage. *[R/UC-2 (wq mon)]*